February 2015

Addendum to Technical Support Document #9

TRAFFIC IMPACT STUDY

TAGGART GROUP OF COMPANIES

THE MILLER GROUP

1.0 BACKGROUND

The site for the Capital Region Resource Recovery Centre (CRRRC) is proposed to be located on the east side of Boundary Road at the northeast corner of Boundary Road and Devine Road. The facility would provide waste diversion activities and a landfill component for the disposal of residual waste materials. The proposed Site access location is directly onto Boundary Road approximately 1,130 m south of Highway 417..

A Traffic Impact Study (TIS) report for the proposed CRRRC was prepared, as reported in Technical Support Document #9, and is a component of the December 2014 Environmental Assessment (EA) report. The traffic study examined the operation of the Site access onto Boundary Road and the impact that the trips generated from the Site would have on the operation of the surrounding intersections. The report examined key intersections that comprised the intersections of rural arterial roads that could be impacted by additional traffic from the Site. The City of Ottawa was consulted on the intersections to be addressed in the TIS. The report did not consider the intersection of Boundary Road and Thunder Road, formally named Ninth Line Road, as the Site was not assigning any expected Site-related trips to Thunder Road and Thunder Road is not an arterial road.

Thunder Road is located approximately 600 m north of the proposed CRRRC site access location off Boundary Road. Thunder Road is a rural collector road as designated in the City of Ottawa Transportation Master Plan. Thunder Road is a two lane rural road that links Boundary Road to Ramsayville Road to the west. Observations and aerial photographs have shown Thunder Road to have a low volume of traffic and would be mainly used by local residents to access farm lands and rural residential homes. The intersection of Thunder Road and Boundary Road is also sometimes used as an access point to the Petro-Canada service station located at the southwest corner of the intersection; however, the Petro-Canada station also has a direct access onto Boundary Road.

Following a review of the December 2014 EA report, staff of the Ministry of Transportation Ontario has requested that the intersection of Boundary Road and Thunder Road be considered in the TIS report. This Addendum addresses the operation of the intersection of Boundary Road and Thunder Road during the weekday peak AM and PM hours. Consistent with the assessment presented in the TIS, the time period for the analysis uses the existing traffic counts and the expected volume of traffic at the year 2022. The year 2022 represents five years beyond the anticipated commencement of the CRRRC site operations, with the traffic analysis being conducted for the 2022 background traffic (without the expected CRRRC trips) and for the total 2022 volume of traffic.

2.0 EXISTING BOUNDARY ROAD / THUNDER ROAD INTERSECTION

Thunder Road is a two lane collector road with gravel shoulders and a rural cross section. The road provides access to farm land and rural residential homes, and forms part of the grid of rural collector roads. Thunder Road has a posted speed limit of 60 km./h. in the vicinity of Boundary Road.

The east limit of Thunder Road terminates at Boundary Road. The Boundary/Thunder Road intersection is a “T” intersection with Boundary Road forming the northbound and southbound approaches, and Thunder Road the eastbound approach. The intersection has the following lane configuration:

Northbound Boundary Road one shared left/through lane

Southbound Boundary Road	one shared through/right lane
Eastbound Thunder Road	one shared left/right turn lane

The intersection is a two-way stop controlled intersection with a "Stop" sign placed at the eastbound Thunder Road approach to the intersection.

A Petro-Canada service station is located at the southwest corner of the intersection. The service station has one access onto Thunder Road located approximately 40 m west of the intersection (centreline to centreline), and an access directly onto Boundary Road located approximately 55 m south of the intersection (centreline to centreline).

Traffic counts were obtained from the City of Ottawa for the Boundary/Thunder Road intersection. The counts were taken on October 13, 2010 with the peak AM and PM hour counts provided in the Appendix as Exhibit 1. Examination of the traffic counts determined that there was an unusually high volume of traffic on northbound Boundary Road during the peak AM hour. This high volume of traffic was not consistent with other traffic counts taken at the Highway 417 interchange by MTO and at the Boundary/Mitch Owens Road intersection by the City of Ottawa. The observation of this high traffic volume is also described in a Traffic Impact Study prepared by Dillon Consulting Limited dated October 2014 for East Gateway Properties Limited, who attributed it to construction on nearby roadways at that time. The volume of traffic for the Boundary Road through movements were therefore adjusted by balancing the traffic with the August 30, 2011 traffic counts taken at the south approach to the eastbound Highway 417 on/off ramps by the MTO (Exhibit 2). Figure 2.1 presents the existing weekday peak AM and PM hour traffic counts.

3.0 TRAFFIC ANALYSIS

3.1 Background Traffic

The background traffic was determined for the year 2022, which represents five years beyond the full development of the site. The volume of traffic was calculated for the weekday peak AM and PM hours. The annual increase in background traffic was determined to be 2.0 percent as documented in the Traffic Impact Study of the December 2014 EA. The 2.0 percent compounded increase was applied to the 2010 traffic movements to/from Thunder Road, and to the 2011 through traffic movements along Boundary Road at the Boundary/Thunder Road intersection, and at the eastbound and westbound on/off ramps of Highway 417. Figure 3.1 presents the expected 2022 peak hour background traffic at the Boundary/Thunder intersection and Highway 417 on/off ramps.

3.2 Total Traffic

The total 2022 volume of traffic is the addition of the 2022 background traffic (Figure 3.1) and the expected CRRRC Site generated trips. The Site generated trips are presented in Figure 3.2, which are the same as presented in the December 2014 EA with the modification of showing the traffic at the Boundary/Thunder Road intersection. The Site generated trips at this intersection are northbound and southbound along Boundary Road with no trips expected or applied to Thunder Road. Figure 3.3 shows the total 2022 peak hour traffic including the trips associated with CRRRC facility.

Figure 2.1: Weekday Peak AM and PM Hour Traffic Counts

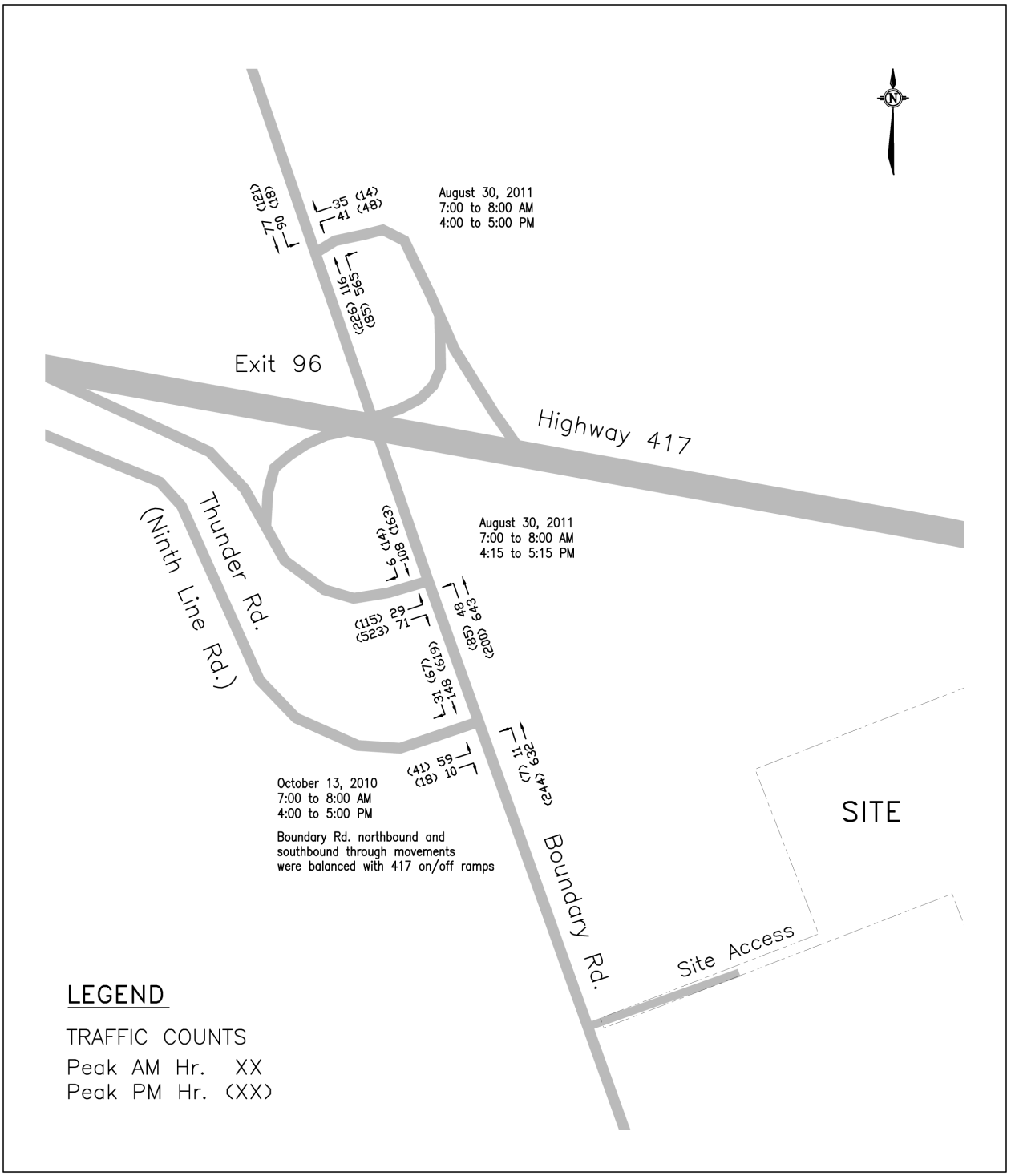
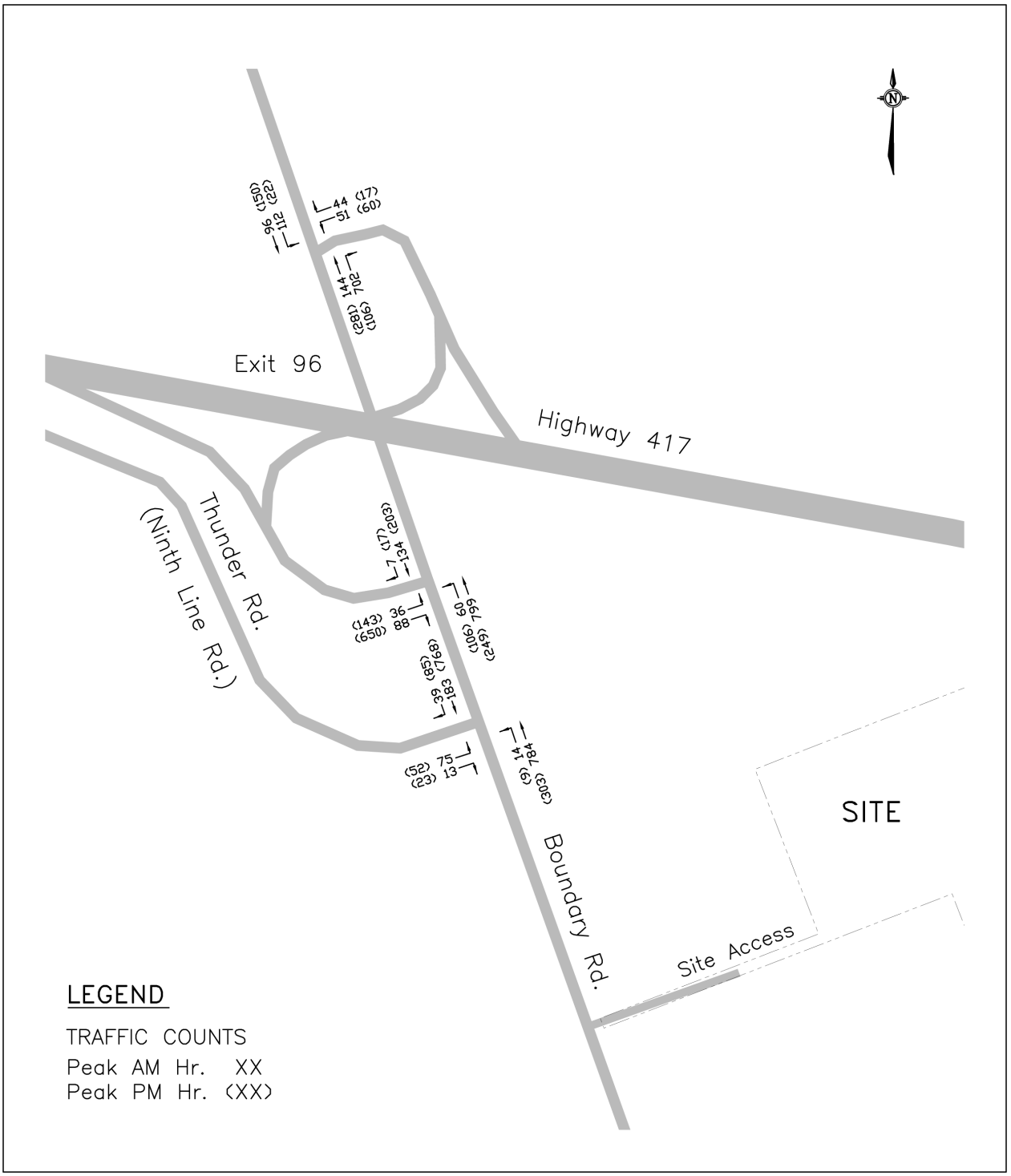
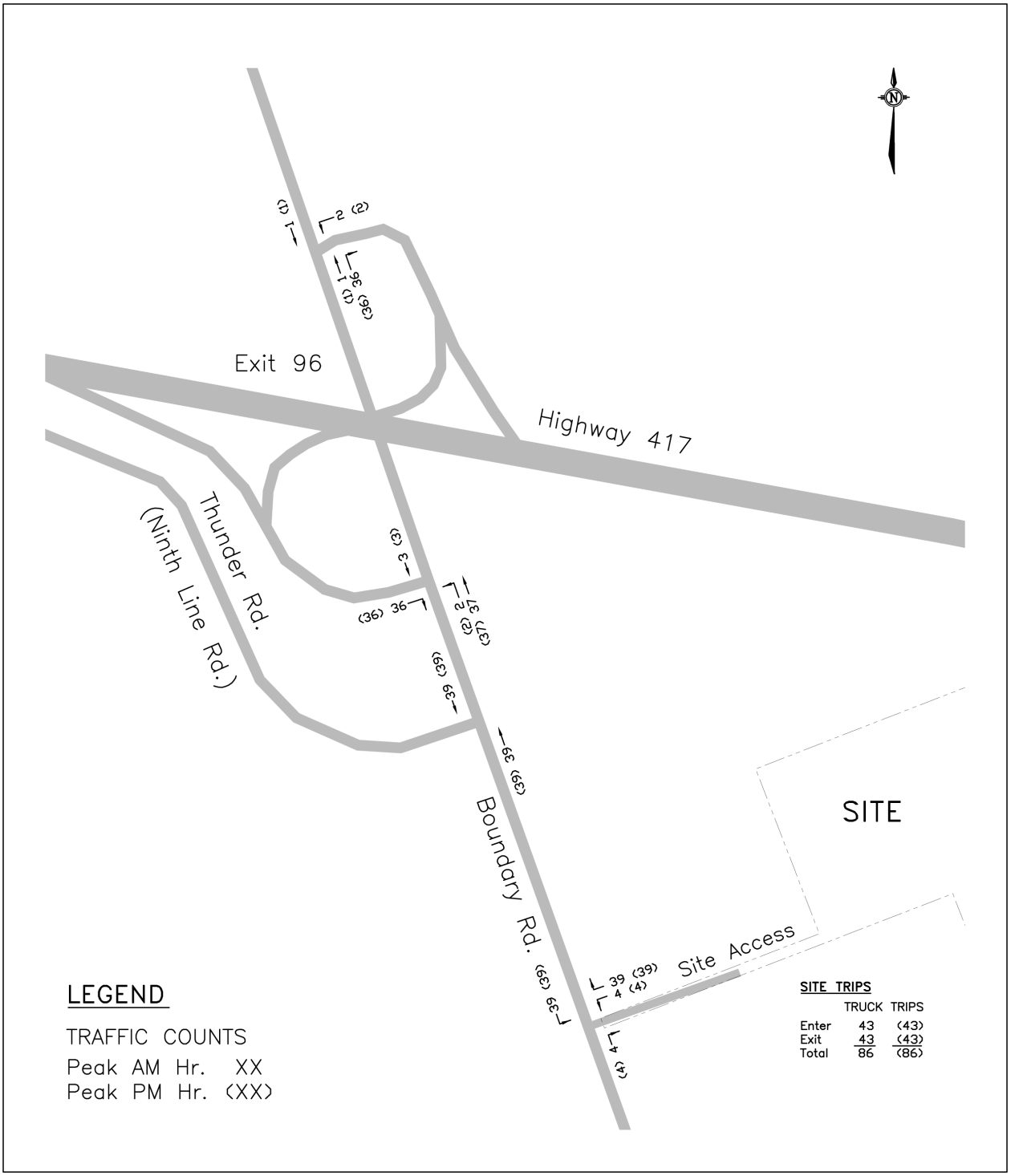


Figure 3.1: Weekday Peak AM and PM Hour Background Traffic



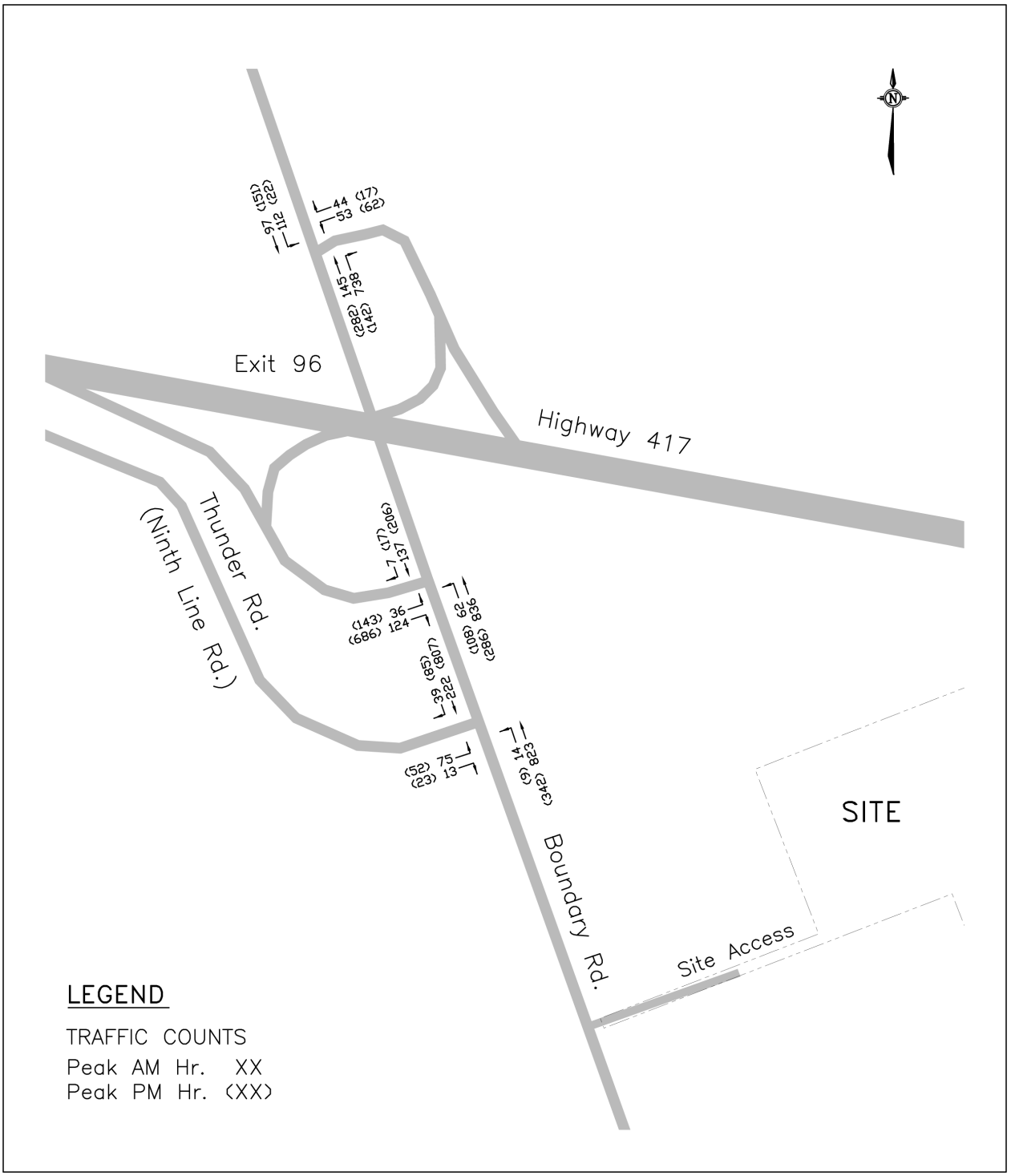
NOT TO SCALE

Figure 3.2: Weekday Peak AM and PM Hour Site Generated Trips



NOT TO SCALE

Figure 3.3: Weekday Peak AM and PM Hour Total Traffic



NOT TO SCALE

3.3 Traffic Analysis

The traffic analysis was conducted for the peak AM and PM hours at three time periods comprising the existing traffic counts, 2022 background traffic (not including CRRRC), and 2022 total traffic. This Addendum only examines the operation of the intersection of Boundary Road and Thunder Road, as the assessment of operations of all other intersections are contained within the December 2014 EA report and the findings and recommendation of that report remain valid.

The operational analysis for the existing 2010/2011 traffic counts at the Boundary/Thunder Road intersection determined that the northbound Boundary Road left/through movement would function at a Level of Service (LoS) "A" and the eastbound Thunder Road left/right turn movement at a LoS "C" during both the peak AM and PM hours. Table 3.1 summarizes the operation of the intersection with the analysis sheets provided in the Appendix as Exhibit 3 for the peak AM hour and Exhibit 4 for the peak PM hour.

For the expected 2022 background traffic (not including the CRRRC facility), the northbound Boundary Road left/through movement would operate at a LoS "A" and the eastbound Thunder Road approach at a LoS "D" during both the peak AM and PM hours as summarized in Table 3.1. Exhibits 5 and 6 present the operational analysis sheets.

For the total traffic expected in 2022 (including the CRRRC facility), the northbound Boundary Road approach would function at a LoS "A" and eastbound Thunder Road approach at a LoS "D" during the peak AM hour, and during the peak PM hour the northbound Boundary Road approach would function at a LoS "B" and eastbound Thunder Road approach at a LoS "D". Table 3.1 summarizes the 2022 operation of the intersection which shows that during the peak PM hour the control delay at the northbound Boundary Road approach would be 10.1 seconds and 34.3 seconds at the eastbound Thunder Road approach. Exhibit 7 and Exhibit 8 present the operational analysis sheets for the peak hours. A traffic signal warrant analysis was conducted for the expected total 2022 traffic, which determined that the intersection would only meet 64 percent of the warrants for the installation of traffic control signals. Signals are therefore not warranted, even for the projected 2022 traffic. The traffic signal warrant analysis is provided as Exhibit 9.

Table 3.1 Boundary/Thunder – LoS and Delay

Intersection Approach	Weekday Peak AM Hour *Existing* 2022 Background (Total 2022)		Weekday Peak PM Hour *Existing* 2022 Background (Total 2022)	
	LoS	Delay (sec.)	LoS	Delay (sec.)
NB Left/Through	*A* A (A)	*7.6* 7.7 (7.8)	*A* A (B)	*9.2* 9.9 (10.1)
EB Left/Right	*C* D (D)	*18.4* 26.7 (31.1)	*C* D (D)	*19.7* 29.7 (34.3)

4.0 FINDINGS

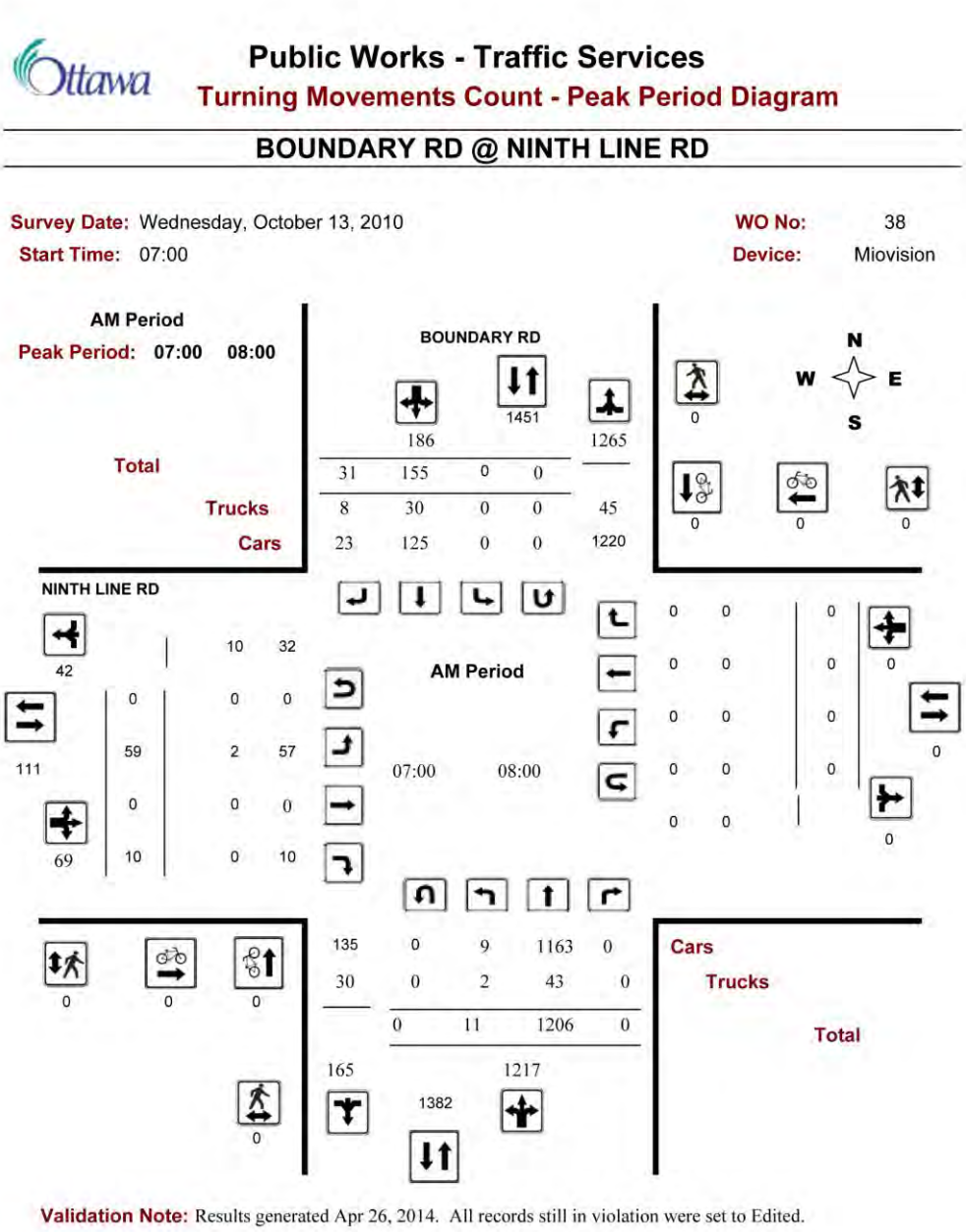
The operational analysis of the intersection of Boundary Road and Thunder Road determined that the additional traffic expected from the CRRRC facility would result in a minor impact on the operation of the Boundary/Thunder Road intersection. There would be no requirement for intersection modifications due to the CRRRC facility.

APPENDIX

Traffic Counts

Operational Analysis

Exhibit 1 Year 2010 Peak AM and PM Hour Traffic Counts – Boundary/Thunder



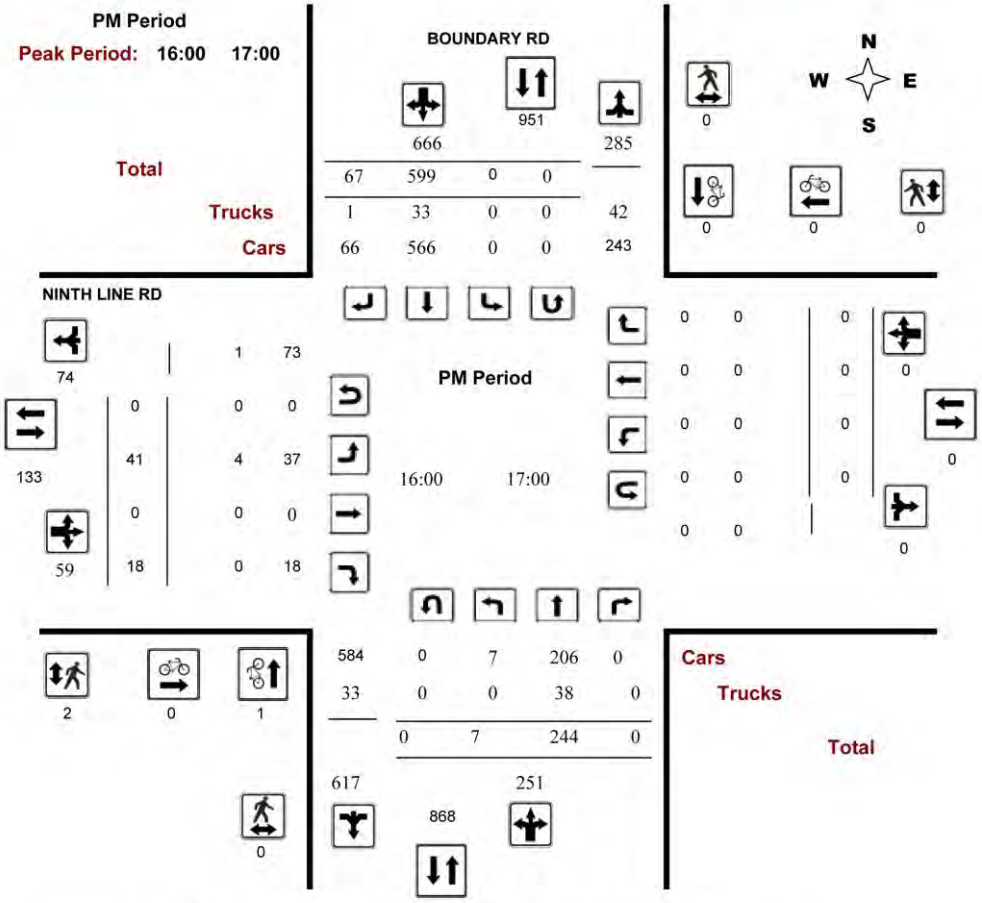
Public Works - Traffic Services

Turning Movements Count - Peak Period Diagram

BOUNDARY RD @ NINTH LINE RD

Survey Date: Wednesday, October 13, 2010 **WO No:** 38

Start Time: 07:00 **Device:** Miovision



Validation Note: Results generated Apr 26, 2014. All records still in violation were set to Edited.

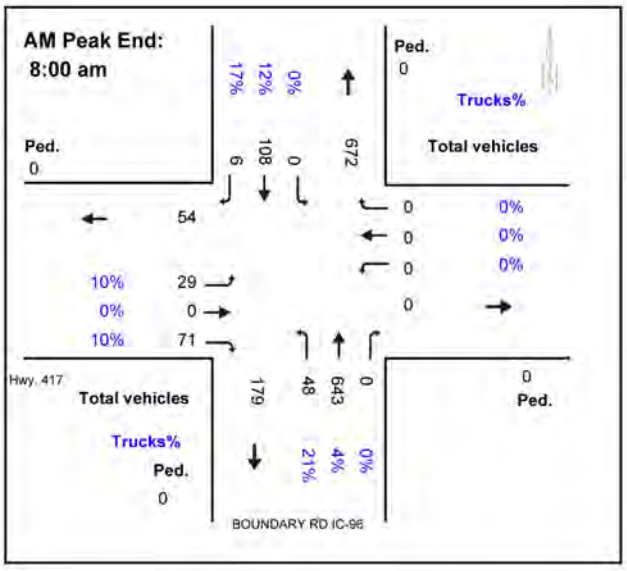
Exhibit 2 Year 2011 Peak AM and PM Hour Traffic Counts – Boundary/Eastbound 417 Ramps

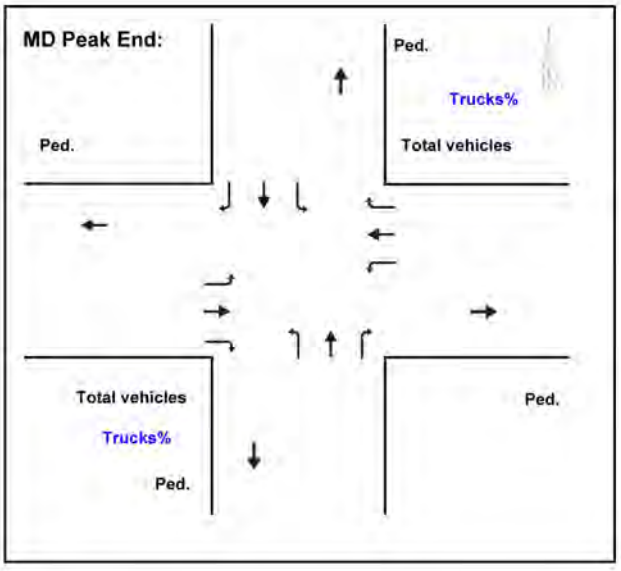
Ontario

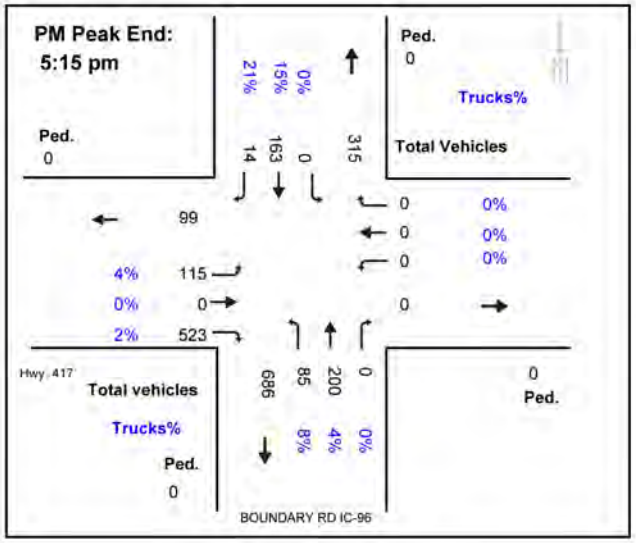
BOUNDARY RD IC-96 @ Hwy. 417

Eastern

Intersection ID:493400000(--S--) **Count Day: Tuesday** **Count Date: 30-Aug-2011**







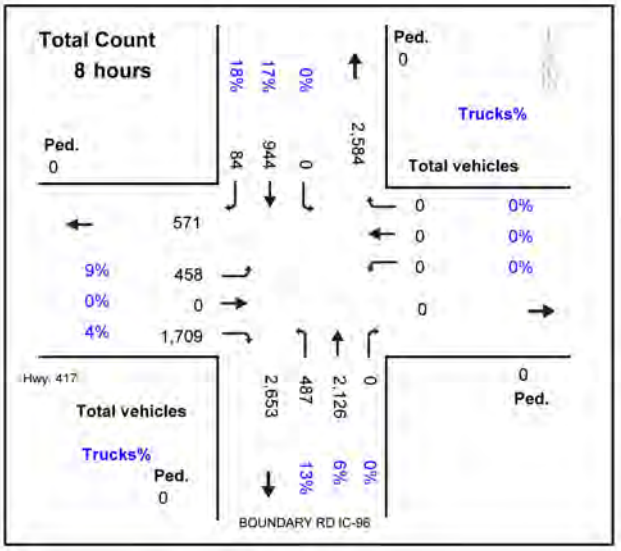


Exhibit 3 Existing 2010/2011 Peak AM Hour Traffic Count Analysis – Boundary/Thunder

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analysis Time Period: **Peak AM Hour**
Intersection: **Boundary/Thunder**
Analysis Year: **Existing 2010/2011**
Project ID: CRRRC Site - **Traffic Counts**
East/West Street: Thunder Road
North/South Street: Boundary Road
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	11	632			148	31
Peak-Hour Factor, PHF	0.92	0.92			0.92	0.92
Hourly Flow Rate, HFR	11	686			160	33
Percent Heavy Vehicles	2	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				59		10
Peak Hour Factor, PHF				0.92		0.92
Hourly Flow Rate, HFR				64		10
Percent Heavy Vehicles				2		2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	11						74	
C(m) (vph)	1380						343	
v/c	0.01						0.22	
95% queue length	0.02						0.81	
Control Delay	7.6						18.4	
LOS	A						C	
Approach Delay							18.4	
Approach LOS							C	

Exhibit 4 Existing 2010/2011 Peak PM Hour Traffic Count Analysis – Boundary/Thunder

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analysis Time Period: **Peak PM Hour**
Intersection: **Boundary/Thunder**
Analysis Year: **Existing 2010/2011**
Project ID: CRRRC Site - **Traffic Counts**
East/West Street: Thunder Road
North/South Street: Boundary Road
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	7	244			619	67
Peak-Hour Factor, PHF	0.92	0.92			0.92	0.92
Hourly Flow Rate, HFR	7	265			672	72
Percent Heavy Vehicles	2	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				41		18
Peak Hour Factor, PHF				0.92		0.92
Hourly Flow Rate, HFR				44		19
Percent Heavy Vehicles				2		2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	7						63	
C(m) (vph)	864						307	
v/c	0.01						0.21	
95% queue length	0.02						0.76	
Control Delay	9.2						19.7	
LOS	A						C	
Approach Delay							19.7	
Approach LOS							C	

Exhibit 5 Year 2022 Peak AM Hour Background Traffic Analysis – Boundary/Thunder

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analysis Time Period: **Peak AM Hour**
Intersection: **Boundary/Thunder**
Analysis Year: **Year 2022**
Project ID: CRRRC Site - **Background Traffic**
East/West Street: Thunder Road
North/South Street: Boundary Road
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	14	784			183	39
Peak-Hour Factor, PHF	0.92	0.92			0.92	0.92
Hourly Flow Rate, HFR	15	852			198	42
Percent Heavy Vehicles	2	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				75		13
Peak Hour Factor, PHF				0.92		0.92
Hourly Flow Rate, HFR				81		14
Percent Heavy Vehicles				2		2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	15						95	
C(m) (vph)	1327						259	
v/c	0.01						0.37	
95% queue length	0.03						1.61	
Control Delay	7.7						26.7	
LOS	A						D	
Approach Delay							26.7	
Approach LOS							D	

Exhibit 6 Year 2022 Peak PM Hour Background Traffic Analysis – Boundary/Thunder

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analysis Time Period: **Peak PM Hour**
Intersection: **Boundary/Thunder**
Analysis Year: **Year 2022**
Project ID: CRRRC Site - **Background Traffic**
East/West Street: Thunder Road
North/South Street: Boundary Road
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	9	303			768	85
Peak-Hour Factor, PHF	0.92	0.92			0.92	0.92
Hourly Flow Rate, HFR	9	329			834	92
Percent Heavy Vehicles	2	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				52		23
Peak Hour Factor, PHF				0.92		0.92
Hourly Flow Rate, HFR				56		24
Percent Heavy Vehicles				2		2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	9						80	
C(m) (vph)	738						224	
v/c	0.01						0.36	
95% queue length	0.04						1.54	
Control Delay	9.9						29.7	
LOS	A						D	
Approach Delay							29.7	
Approach LOS							D	

Exhibit 7 Year 2022 Peak AM Hour Total Traffic Analysis – Boundary/Thunder

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analysis Time Period: **Peak AM Hour**
Intersection: **Boundary/Thunder**
Analysis Year: **Year 2022**
Project ID: CRRRC Site - **Total Traffic**
East/West Street: Thunder Road
North/South Street: Boundary Road
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	14	823			222	39
Peak-Hour Factor, PHF	0.92	0.92			0.92	0.92
Hourly Flow Rate, HFR	15	894			241	42
Percent Heavy Vehicles	2	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				75		13
Peak Hour Factor, PHF				0.92		0.92
Hourly Flow Rate, HFR				81		14
Percent Heavy Vehicles				2		2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	15						95	
C(m) (vph)	1279						231	
v/c	0.01						0.41	
95% queue length	0.04						1.89	
Control Delay	7.8						31.1	
LOS	A						D	
Approach Delay							31.1	
Approach LOS							D	

Exhibit 8 Year 2022 Peak PM Hour Total Traffic Analysis – Boundary/Thunder

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analysis Time Period: **Peak PM Hour**
Intersection: **Boundary/Thunder**
Analysis Year: **Year 2022**
Project ID: CRRRC Site - **Total Traffic**
East/West Street: Thunder Road
North/South Street: Boundary Road
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	9	342			807	85
Peak-Hour Factor, PHF	0.92	0.92			0.92	0.92
Hourly Flow Rate, HFR	9	371			877	92
Percent Heavy Vehicles	2	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				52		23
Peak Hour Factor, PHF				0.92		0.92
Hourly Flow Rate, HFR				56		24
Percent Heavy Vehicles				2		2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	9						80	
C(m) (vph)	711						201	
v/c	0.01						0.40	
95% queue length	0.04						1.78	
Control Delay	10.1						34.3	
LOS	B						D	
Approach Delay							34.3	
Approach LOS							D	

Exhibit 9 Year 2022 Traffic Signal Warrant Analysis – Boundary/Thunder

MINIMUM WARRANTS FOR INSTALLATION OF TRAFFIC SIGNAL USING PROJECTED VOLUME

Location Boundary Road **of** Thunder Road (Ninth Line Road)
(Roadway) **(Intersecting Road)**

Municipality City of Ottawa **Projected Volume** Year 2022

WARRANT	DESCRIPTION	MINIMUM REQUIREMENT FOR 2 LANE HIGHWAYS		COMPLIANCE		
		2. FREE FLOW	3. RESTRICT. FLOW	SECTIONAL NUMBER	SECTIONAL %	4. ENTIRE %
1. VEHICULAR VOLUME	1. A. Vehicle volume all approaches (Average hour)	(480)	720	626	100	23%
	B. Vehicle volume, along minor roads, (Average hour)	~~120~~ (180)	170	41	23	
2. DELAY TO CROSS TRAFFIC	1. A. Vehicle volume, along artery (Average hour)	(480)	720	585	100	(64%)
	B. Combined vehicle and pedestrian volume crossing artery from minor roads, (Average hour)	(50)	75	32	64	

Projected Average Hour - Use the sum of the AM and PM Peak volumes divided by 4

NOTES:
1. Vehicle volume warrants (1A) and (2A) for intersections of roadways having two or more moving lanes in one direction, should be 25% higher than the values given above.

2. Warrant values for free flow apply when the 85 percentile speed of artery traffic equals or exceeds 70 Km/h or when the intersection lies within the built-up area of an isolated community having a population of less than 10,000.

3. Warrant values for restricted flow apply to large urban communities when the 85 percentile speed of artery traffic does not exceed 70 Km/h.

4. The lowest sectional percentage governs the entire Warrant.

5. For "T" intersections the warrant values for minor road should be increased by 50 % (Warrant 1B only).

6. The crossing volumes are defined as:
   (a) Left turns from both minor road approaches
   (b) The heaviest through volume from the minor road
   (c) 50% of the heavier left turn movement from major road when both of the following are met:
      (i) the left turn volume > 120 vph.
      (ii) the left turn volume plus the opposing volume > 720 vph.
   (d) Pedestrians crossing the major road.